

software age

A MANAGEMENT SYSTEM FOR IMPROVING
SOFTWARE CAPABILITY. SEE PAGE 8

JULY 1968



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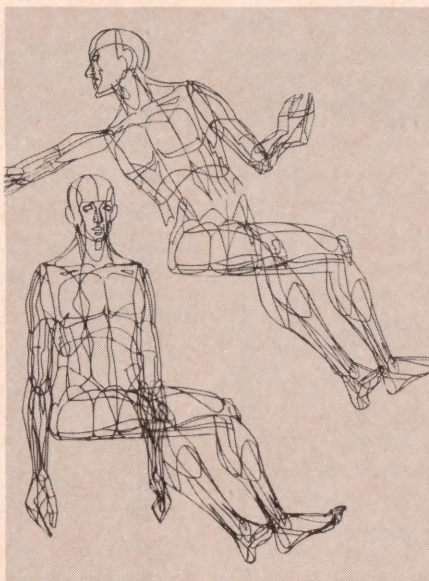
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CONTENTS

PAGE

Editorial—The Information Industry	5
Syntax-Directed Cross-Reference Listing	
..... Robert L. Glass	6
A Management System for Improving Software Capability -- John E. Melde and Robert L. Peters	8
Software Technical Writers Join the Programming Team	Marilyn J. Bohl 16
Winners of Trouble-Tran Problem 2	20
Trouble-Tran Adventures for Fun and Profit	21
Market Place—The Classified Ad Department of Software Age	22
New Products	25
Confidential Inquiry Form	29
Index to Advertisers	30

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COVER: Many of the functions of a computer—from grinding out tapes and punched cards, to packaging carrots and even to composing and playing music—are whimsically illustrated on our cover by Alan Dougherty of TRW.

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The Information Industry

■ Business, industry, government, research and defense have all developed such insatiable appetites for information—information collected, digested and delivered either in “real time” or so promptly as to be near-indistinguishable from real time—that information processing has become a major “industry.”

However, while its sheer scope may be said to give it the status of an industry, it must be recalled that it is *not* an industry in and for itself for the simple reason that it is not an *end* in itself. Even the design and manufacture of data-processing equipment, high-speed transmission equipment, etc., though it may seem a distinct industry, is so completely predicated upon the requirements of users that its separate identity is all but lost in actual practice. That is, the computer manufacturer does not—cannot—design and build a computer according to the best possible way to build a computer. Instead, he must design for the best way to fit the requirements of a customer or category of customers. The computer is not an end in itself; it is the means to an end.

Similarly, the data processing specialist can't write a program according to best possible way to break down a given flow of information. He must write a program to extract and deliver, as quickly as possible, the particular information which the customer requires in his own operation—even if it means performing certain steps far out of logical order. Data processing is not an end in itself; it is the means to an end.

And the end is dictated by the customer, not the computer manufacturer or the programmer. If the customer wants to know what effect today's operations are going to have on the annual report before he knows the results of today's operations per se, that's the way it has to be done.

More to the point in many of today's applications of information processing is the requirement for instantaneous and automatic reaction to information which, in itself, is of only a dubious historical value. It may, for instance, be of interest and value to scan the records of a month or a year and look for common denominators among variations in monitored parameters of processing and defective or rejected batches of tinplate. But that can be next month or next year: the *important* part of the data processing operation may be to provide an alarm or control signal immediately when the monitored parameters wander outside established limits or relationships.

The Joint Computer Conferences — and the extension of that concept to an international

scale — serve a real purpose in keeping the computer manufacturer and the EDP specialist in touch with the user and his needs and future requirements.

How different is this concept from some of the asinine proposals to regulate data processing and telecommunications under an archaic set of rules which no longer reflect the realities of the communications industry and were never meant to reflect the realities of the data processing industry.

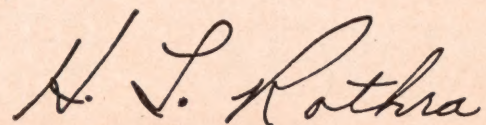
The numerous regulations and restrictions relating to “voice” and “record” communications, for instance, probably made sense once as the means to insure a desired degree of competition without promoting cut-throat competition among government-created giants of communications. They certainly don't make any sense in the communications business today and efforts to extend them to data transmission and processing are so ridiculous as to merit no serious consideration from anyone.

There is a case to be made against permitting a communications firm to use its “monopoly” position to compete unfairly in teleprocessing; but there is certainly no case for establishing tight control over teleprocessing as such. There is hardly a more competitive business in the world today!

If the government wishes to promote free competition in the teleprocessing business, let's knock down some of the barriers which existing regulations place in the way of providing and purchasing precisely the kind of communications needed. This may be a straight-data channel, off-time on a predominately voice channel or the brief inevitable pauses between words and sentence on an otherwise straight voice channel.

The uninhibited growth of the teleprocessing business is so much to be desired by the communications industry, by business in general and, hence, the government, that there seems no possible justification for building new barriers.

The cheaper, better, more flexible, more available and more efficient data communications can be made, the more customers it will have. Data transmission, like data processing, is not an end in itself. Anyone in the business who forgets that fact, does so not only at his own peril but to the detriment of the whole “industry.” ■



Syntax-Directed Cross-Reference Listing

Robert L. Glass

The Boeing Company, Aerospace Div.
Seattle, Washington

■ It can be of considerable value in working with textual material, such as programs, to be able to produce a cross-reference listing of the material . . . that is, a list of some or all of the words or names used in the text, followed by the locations at which they are used. In particular, a cross-reference list quickly solves such problems as:

- (1) In programs which are maintained and/or modified over a long period of time, "I must change the method of handling parameter ALPHA. How many times do I refer to it, and where?"
- (2) In natural language texts, such as program documentation, "Where is topic BETA discussed, and where are all other references to BETA?"

It is possible to construct a cross-reference lister which satisfies these needs and is source language independent, by means of extremely elementary syntax-direction techniques. What follows is a description of the design and implementation of XREF, a syntax-directed cross-reference lister.

TABLE CONSTRUCTION

XREF is driven by tables of syntax-defining information constructed by reading in control information which defines certain basic aspects of the text language syntax. Syntax elements specified by the user are:

- (1) Those characters and/or card columns which serve as separators in the language.
- (2) Those areas of source text which may be ignored.

In addition, the user may specify

- (3) Those words or names to be exclusively included in, or excluded from, the list.

Those tables used within XREF for text analysis are the name list, the card column separators, the card column pairs defining regions to be ignored, the character strings which serve as card terminators, the character strings which cause an entire card to be ignored, and the machine character set with one flag per character saying whether that character is a separator or not. The source text is checked against all tables except

(Continued on page 23)



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XEROX

a management system for improving software capability

John E. Melde and Robert L. Peters
TRW Systems, Redondo Beach, California

INTRODUCTION

■ Most technical organizations maintain a few select scientific computer programs upon which they rely heavily for a large part of their basic engineering analysis. These programs might be, for example, related to structural analysis, fluid dynamics, electronic circuit analysis, or thermal analysis, depending upon the basic product lines of the organization. Typically, the initial development of any basic analysis program is performed in support of a particular contract or, possibly, several contracts held by a particular engineering area. At a time when contract awards relating to the pro-

gram are at a low ebb, efforts directed toward improving the program usually diminish or even stop since funding for direct programming support is not available. Unfortunately, this situation can feed upon itself in that failure to increase the capability of the program can result in not being able to adequately perform analysis required in future proposals. Even though the anticipation of future program needs may exist, the actual funding for improving software capability may simply not be available at the time when it is needed.

An additional problem often arises internally with respect to a basic analysis program that is common to and provides the analytical base for several different engineering areas. This has to do with the fact that if one area is using the program very little, a heavily committed area must,

by itself, bear the brunt of current debugging or updating costs.

The maintenance of multiple versions of a basic program to support, perhaps, special projects or different user areas is also commonly encountered—with the accompanying divergence of program characteristics (input formats, mathematical techniques, etc.). Of most significance, however, is the duplication of effort in programmer training and parallel programming efforts.

This paper describes a software management system which was developed by the authors to assure a continual increase in program capability, cost sharing among all users,

Figure 1. Physical Thermal Problem

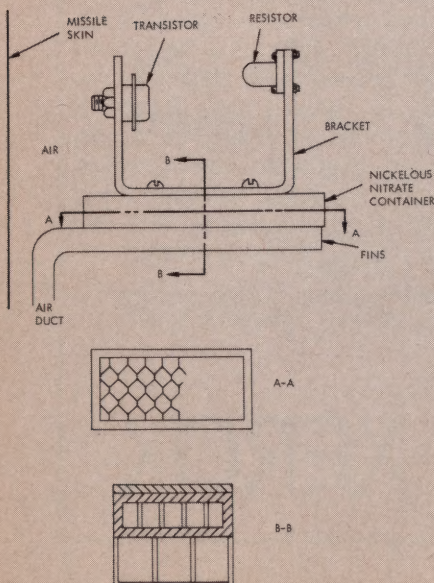
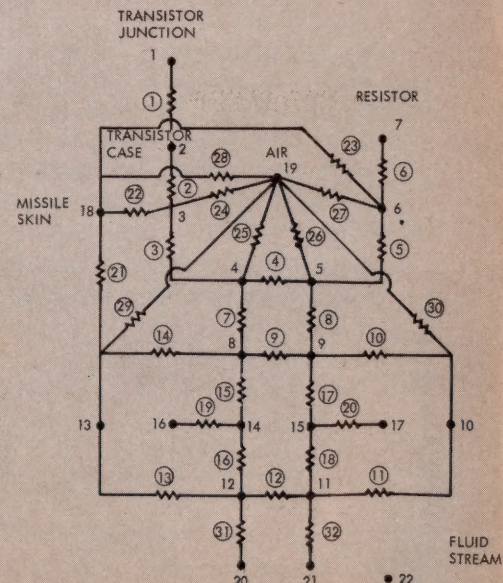
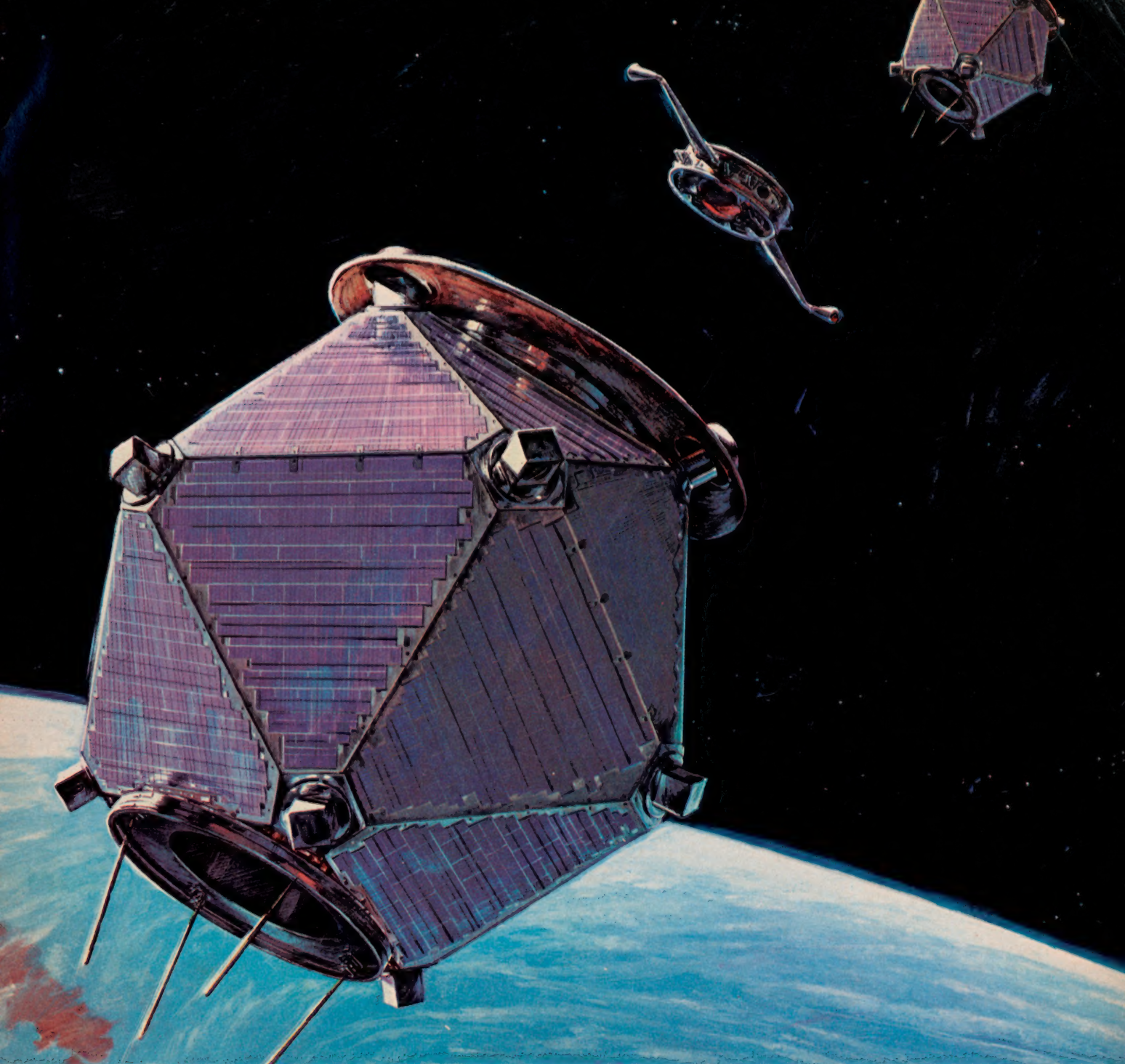


Figure 2. Analytical Thermal Model



John E. Melde, BS Physics, 1962 and BA Mathematics, 1963 from the University of Texas. Presently pursuing Masters degree in Aerospace Operations Management at USC. Has been with TRW Systems for five years—presently Group Leader, Thermodynamics Group—supervising six programmer analysts performing scientific programming in the areas of heat transfer, nozzle performance, and fluid dynamics. Member ACM since 1964.

Robert L. Peters has been with TRW Systems for the past eight years. He currently is a Section Head supervising three programming groups performing scientific programming in the areas of fluid dynamics, thermodynamics and heat transfer, and re-entry dynamics. His computing experience began in 1956 in the areas of scientific programming, real time simulation, and N/C. Member ACM.



and elimination of parallel programming efforts with the accompanying reduction in overall computing costs.

SOFTWARE MANAGEMENT SYSTEM

The computer program to which attention was directed was TRW Systems' generalized three-dimensional heat transfer program which, by virtue of the lumped-parameter electrical network analogy employed (Figures 1, 2), is capable of performing thermal analysis related to an extremely diverse range of engineering disciplines. Because of this inherent generality, more than seventy engineers from eleven distinct engineering departments were con-

Heat-transfer problems can range from how to dissipate the heat from a single transistor to how to "manage" thermal balance in a satellite plunging from $+250^{\circ}$ to -250° several times daily. How do you assess software costs against two such diverse undertakings?

tinually using the program to perform their thermal analysis. Applications ranged from spacecraft heat transfer to rocket engine heating and electronic circuit thermal analysis. The heavy production usage of the program (an average of four to five hours of central processor time per week) reflected the extent to which the program was relied upon for analysis and provided a firm base upon which a software management system could be established.

Efforts aimed at increasing the ca-

pability of the program were, at best, sporadic and had little or no coordination among the users of the program. The few improvements that were made to the program were usually initiated by individuals—possibly without the knowledge or advice of other areas—and these alterations frequently had an adverse effect upon other users of the program. Most frequently these took the form of altered input requirements and increased program execution time for all users due to program

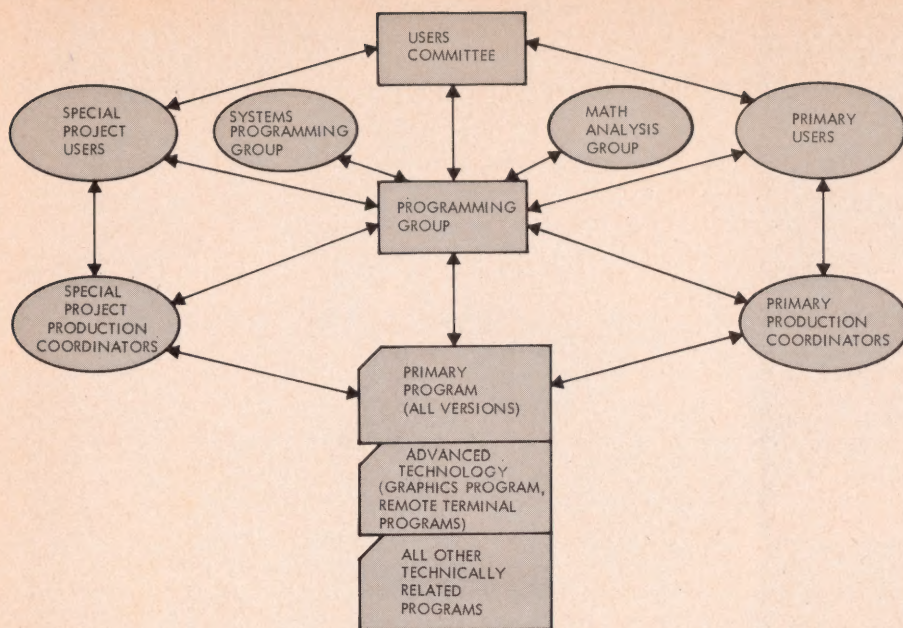


Figure 3. Software Management Model

options that benefited only a select few. Of the most significance, however, was the fact that there was little evidence of any long-range planning for improved software ca-

pability. In addition, special projects had resulted in the creation of a number of different versions of the program. Since a closed-shop type of programming situation existed, it

was noted that various versions were being maintained independently of one another by separate programming groups. Associated with the various programmers were production coordinators who handled the actual submission of runs. Separate groups also provided occasional systems support and mathematical analysis support.

Within this environment, a software management system, designed to ensure continual improvement of the thermal analysis program, was initiated through the implementation of the following procedures:

- 1) Funding for programmer support was established on the basis of the weekly production usage of the program. This amounted to requiring every user of the program to provide a specified number of programmer support hours for each hour of computer time used in making production runs on the program.
- 2) A single group of programmers was assigned the responsibility for maintenance of all versions of the program.
- 3) A users committee was formed (Figure 3) which consisted of representatives from the programming group and each of the engineering areas which made significant use of the program. This committee was established to serve as a central source of information for all program users and assumed responsibility for defining the program capabilities which were needed to maintain a competitive posture. Once the requirements were established, priorities were to be assigned to the identified tasks.

The establishment of programmer support on the basis of the production usage of the program is a central feature of the system as far as ensuring continual improvement of the program is concerned. It means, first of all, that this improvement is an integral part of the program and could be looked upon by the user as being simply a slightly greater machine rate for the use of the program. Secondly, *all* users contribute to the system—in proportion to the amount of use they make of the program.

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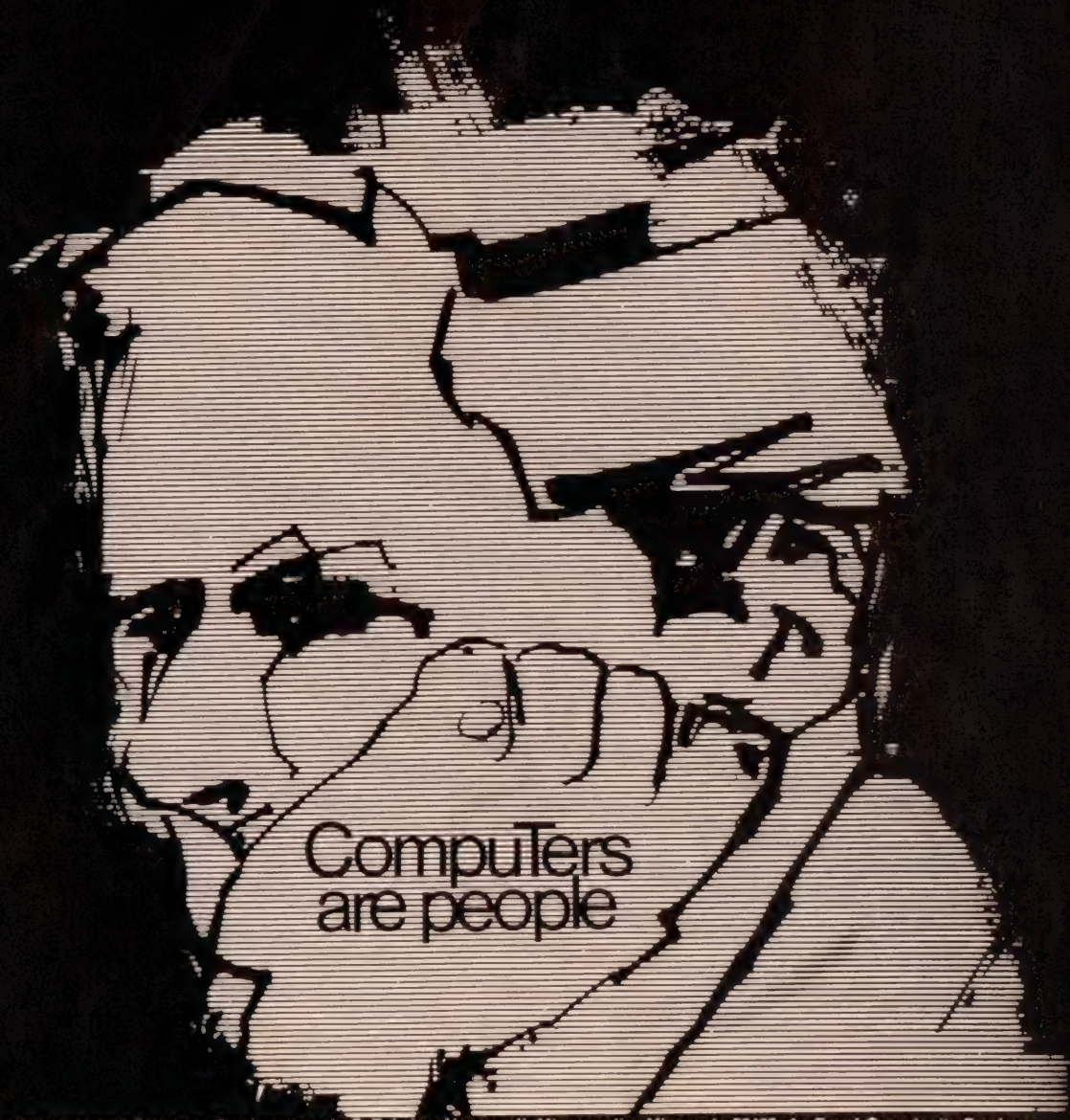
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single programming group of all versions of the program produced many additional benefits. Even though several versions were required to be maintained due to special applications, compatibility could, at least, be maintained between the versions. Since all improvement efforts were coordinated by the users committee, duplication of programming effort was eliminated, thereby reducing the overall computing cost. All users received the benefit of innovations developed by a single source (improved mathematical techniques, reduced program running times, etc.). Since several programmers are at all times concerned with the maintenance and development of the program and are aware of the current status of all projects, training can be approached in an effective and systematic manner—eliminating the situation in which the termination of an experienced programmer hinders the progress of the project due to loss of program knowledge. Centralization allows experienced programmers to train their successors, this process being carried on continuously and therefore resulting in sev-

eral levels of programmer experience at any one point in time.

Perhaps the key factor in the successful operation of this system, as in any management system, is that of communication. Users must be continually advised as to how their improvement dollars are being spent. Individual engineers must be afforded the opportunity to bring their requirements before the users committee and must have some assurance of a timely completion of their requested program modifications. This communication is maintained not only through regular meetings of the users committee but also by report generation designed to provide the engineers, the programmers, and the users committee with timely and adequate system information.

Each of the major user areas submits to the programming staff a quarterly support forecast indicating the expected amount of computer time that their areas will use during the coming quarter (based upon actual contracts held). This allows the programming group to meaningfully establish manpower levels for that period of time. This information is

also required by the users committee in order to be able to assign priorities on the basis of available manpower compared to the current backlog of modification requests. Having an estimate of computer usage and, consequently, the amount of manpower available for the next quarter, the programming group prepares a quarterly milestone report and submits it for approval to the users committee. This report indicates the planned program activities for the quarter, the level of effort that will be devoted to each activity, and estimates of their completion dates. Program activities are divided, as required, between rapid response to immediate (smaller) problems and long-range improvement projects. Once the schedule is finalized by the committee, it is distributed to all users of the program in order to keep them informed on the current status of the system. Progress relative to the milestone items is reported to all users on a monthly basis in the form of system activity bulletins. These provide a monthly status report for each subtask being performed and provide a

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means for notification of unexpected delays or of the completion of any subtask during the preceding month. Thus, everyone involved in the system is continually made aware of its status.

The production coordinators submit weekly reports of program usage to the programming staff. These reports give, along with other information, the machine time, the name of the user, and the accounting number for every run made on the program. The practical value of this report is that it is the basis upon which the level of programmer support is established, and it provides the accounting numbers against which the programmers charge their time each week. It also allows a comparison of actual machine usage with the quarterly forecasts prepared by the engineering areas. Data is thereby made available for validating, to some extent, future forecasts.

In addition to the usage report, the production coordinators prepare a quarterly error summary for the program. This report indicates the number of errors made by users in

the preparation of their input data, program errors, keypunch errors, computing system errors, and errors made by the production coordinators themselves during the submission of runs. This data provides the programming staff with a means of monitoring the use of the program, allowing them to identify problem areas and make modifications that will facilitate and economize program usage.

Communication external to the system is also regularly maintained. This amounts to advertising the general problem-solving capabilities of the program throughout the corporate organization. Newsletters, technical memoranda, and seminars are typical means of making potential users aware of the program and its availability.

SUMMARY

Providing programmer support on the basis of the production usage of a basic analysis program will assure a continual level of effort for improving software capability. Effective cost reduction is achieved by con-

solidating into one group all programming efforts related to the program. Based upon an evaluation after the first year of operation, the system was considered by the users committee to be of sufficient technical merit that it would be continued indefinitely and, in fact, was expanded in scope. The system was extended to encompass programs other than (but technically related to) the basic analysis program, and provision was made to use some of the programmer support for the creation of entirely new programs within the same realm of technical interest. This has included the development of remote terminal versions of the program to improve turn-around time for small problems and the development of a graphics console version to allow all users, but designers in particular, to be able to have direct interaction with the program. Finally, the merit of the system is further evidenced by the fact that other technical disciplines are implementing the system with respect to their own analysis programs. ■

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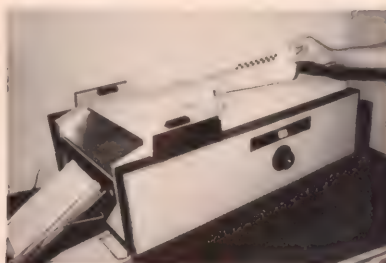
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Software Technical Writers Join the Programming Team

To Share Knowledge

What are the responsibilities of the programmer? When should a technical writer be assigned to a project? What responsibilities and capabilities can the software technical writer be assumed to possess? How does the programmer or the writer facilitate the work of his team member?

Such questions are posed and discussed in this article. A relatively new or uncommon approach—assigning not only a programmer but also a software technical writer and an editor to a project during the design phase—is recommended and justified. Software documentation is viewed as part of the total product, just as creation of this documentation is viewed as part of the total project. The author offers suggestions and clarifies responsibilities in an effort to assist management, programmers, and software technical writers who work cooperatively in situations such as the author describes.

■ "When a light parenthesis is encountered at any valid point other than after a variable where it expresses a subscript, exit 15 is selected."

A light parenthesis! Is this character a comparatively recent innovation of the English language? Did the writer of the sentence originally use the word "left"? Or did he use the word "right"?

[Something] expresses a subscript. Is "it" a parenthesis? Is "it" a variable?

Exit 15 is selected. By whom—or by what? In the logic of a computer program, must the user identify the special character and execute a

branch instruction accordingly, or is a branch to exit 15 performed automatically?

"Data processing," "computers," and "communications" are discussed extensively within our society. Computers are being applied in seemingly dissimilar areas such as space technology, factory payrolls, automated banking services, and dating bureaus. This diverse range of applications has turned the attention of many people toward the computer industry. The degree of familiarization with or understanding of either basic concepts or specific details of the industry by these people varies widely.



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Persons more directly associated with the ideas of data processing are working within the computer industry. These persons include administrators, systems analysts, programmers, computer operators, field service engineers, etc. As was noted of society, in general, they also possess varying degrees of familiarization with or understanding of current trends in the industry, advantages of particular hardware, potential uses of computers, etc. Additionally, however, in relation to their particular jobs, they deal with specific facts or details. These persons recognize or learn by experience that some information—not instead of, but in addition to, basic concepts—must be presented and interpreted in precise terms. Two groups within the industry who frequently cooperate to provide such information are programmers and software technical writers.

FORMATION OF A TEAM

A programmer constructs a program or a system of programs to meet specific objectives. Others can use his program effectively only if they are told some of its characteristics, i.e., of options which have been included, variables (parameters) which must be specified, applications which the program has been designed to perform, etc.

To organize and present this information is the function of a software technical writer.

Programmers and software technical writers cooperate as team members to provide basic information that enables users to maximize benefits of available software. Each has specific knowledge and skills to share.

The programmer understands the basic design of the program which he flow charts, codes, and checks out. The internal logic of the program, the format of input/output files, and similar programming details must be recorded as internal maintenance documentation. Flow charts, supplementary narratives, and specifications are commonly required. A technical writer may assist in this documentation, but, generally, the programmer must accept responsibility for its completion.

External documentation, i.e., information that others must obtain in order to understand the functions of

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a program or to use it effectively, is developed by the software technical writer. The assistance which he receives from the programmer is a significant determinant of the quality of this documentation and of the efficacy with which it can be provided. One-page or two-page announcements of capabilities and characteristics of the software package in which the program is included, introductory bulletins providing general information for management or for persons working directly with the system, and reference manuals are examples of external documentation. The audience—experience, position, and objectives of the typical reader for whom a particular document is intended—must be recognized by both the programmer and the writer and accepted as a vital factor in determining the scope of presentation and the degree of detail.

The programmer is the primary source of technical information such as equipment requirements, language elements, input formats, parameters for macro routine specialization, available options, and error recovery procedures. Some program-

mers prefer to provide this information for the software technical writer in list, outline, or narrative form. Required internal documentation may provide the basis for communication of information. Other programmers and technical writers work primarily through discussion sessions at which both have opportunities to comment, suggest, and question. In any case, the programmer frequently offers additional suggestions and answers specific questions raised by the technical writer as work progresses. Since all required information is commonly not available when writing begins, establishment of milestone dates on or before which information will be supplied to the technical writer is often essential. Dates by which segments of writing will be completed are scheduled accordingly.

The programmer assists his team-mate by introducing him to other persons from whom supplementary or background information must be obtained. For example, other programmers may be creating system input/output routines or error identification procedures that are used by the particular program to be documented as well as by other programs. The programmer may also be cognizant of related documentation in available bulletins or manuals that applies directly to the current task. If the software to be described is an extension to or modification of an existing program, the programmer assists in isolation of specific portions of released documentation that must be modified.

What, then, are the responsibilities and capabilities of the software technical writer? His background is often unique. Some writers are very familiar with the field of data processing; others are experienced writers, but in seemingly unrelated areas.

Management personnel commonly state that prospective employees must possess a college degree or its equivalent. Applicants who have acquired general training in digital systems (or who demonstrate programming aptitude) and exhibit proficiency in English are preferred. New entrants into the field are commonly classified as associate technical writers. Promotions to technical writer and to senior technical writer

are awarded on the basis of performance and experience.

The technical writer cannot be expected to possess extensive prior or related knowledge of a subject, but he can be expected to comprehend information that is presented to him and to assimilate ideas without repetition. While a writer is not necessarily expected to be or to become an expert in his subject, he writes clearly and functionally only when he understands the technology well. He must apply his training, skills, and experience to the current project. Indeed, an experienced technical writer within a company is frequently knowledgeable of programming and systems developments in related areas. He assists significantly in establishing uniformity or identifying commonality among program elements.

A NEW APPROACH

One management approach which the author recommends is to assign not only a programmer but also a software technical writer during the design phase of a project. When this approach is effected, both the programmer and the writer obtain general information at design reviews. Information which the technical writer is not required to know is disregarded or merely accepted by him; he need not attempt to understand the intricate details of programming or of system analysis. He does, however, become familiar with some ideas that must otherwise be provided by the programmer at a later date and recognizes areas in which he must seek supplementary or background information.

The writer also becomes familiar with system terminology. The manual which he is to prepare is commonly part of a complete set of documentation. Nomenclature for system files, related programs, common error routines, etc., must be standardized throughout the set.

Additionally, when this approach is used, both the programmer and the writer function as part of a task group. Documentation is viewed in perspective as part of the total project of providing software for the user. The technical writer does not represent an additional burden that is introduced to the programmer during critical testing cycles!

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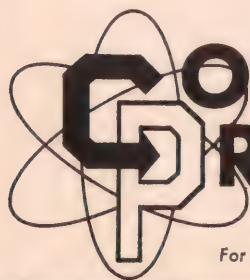
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initiation of a project facilitates the preparation of complementary manuals or sets of manuals. If management desires, a preliminary manual or set of manuals is produced as an introduction to the system or software or as a summary of important elements. This preliminary documentation is available at the final design review and published immediately thereafter. At this time, also, an outline of the final manual is established. The final manual or set of manuals and the software are released simultaneously.

TIME FOR REVIEW

As writing proceeds, review procedures must also be established. Documentation is reviewed by the programmer after a complete draft has been prepared, or as sections of the draft are written, depending upon the scope, organization, and length of the manuscript. Additional immediate or pending considerations which demand the programmer's or writer's attention also affect the selection of review procedures. An important principle governs activities: The manuscript—not the technical writer—is subject to review.

The attention of the programmer is centered primarily upon the technical completeness and accuracy of the manuscript. Preparation of a preliminary outline by the technical writer, or by the writer and the programmer, and referral to this outline throughout the task significantly reduces the probability of omission or repetition of vital information. In most cases, test or support personnel

(Continued on page 28)

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1. WILL IT COMPILE?
2. WILL THE LOADER GIVE ANY DIAGNOSTICS?
3. WILL IT EXECUTE IF STATEMENT $A=B+X(J)$ IS BYPASSED?
4. WHAT HAPPENS WHEN WE TRY TO EXECUTE $A=B+X(J)$?

```
MAIN PROGRAM      SUBROUTINE XTRAN
.                  COMMON /X/X(10)
.                  .
A = B + X (J)      .
.                  .
END                END
```

THE PROGRAMMER INTENDED TO USE THE SAME COMMON CARD IN THE MAIN PROGRAM BUT FORGOT TO INSERT IT.

XTRAN'S ANSWER TO LAST MONTH'S PROBLEM

PROBLEM #4

SUBROUTINE XTRAN USES MORE STORAGE THAN SUBROUTINE YTRAN, BECAUSE OF THE EXTRA STA INSTRUCTIONS NEEDED IN THE STATEMENT

$$Y = X^{**3} + X^{**2} + X + 1.$$

AS YOU SEE X APPEARS IN THE STATEMENT 6 TIMES (NOT 3). X^{**3} COMPILES JUST AS $X*X*X$, SIMILARLY X^{**2} COMPILES JUST AS $X*X$.

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the name list at appropriate times as the source characters are read in.

The name list is like that of a compiler and contains all names referenced and a threaded list of their references. It is accessed by a hash code technique, and contains, for each name, pointers to a table containing the first reference line for that name, and to a table containing the character string which is the name itself. (The arbitrary but common language restriction of limiting names to 6 or 8 characters cannot be tolerated here, since the processor is source language independent, and provision is made for variable length names up to 36 characters in length.) In the reference line table, reference lines are entered sequentially and are thread-connected to the previous reference for the name in question.

USER LANGUAGE

The language in which the user specifies the syntax of his text language attempts to be readable and format-free. As discussed previously, three categories of syntax definition must be supplied by the user—separator criteria, ignorable area specification, and inclusion/exclusion information. In the control language, the termination of each category is specified by a period; the

termination of all input information, by more than one period. The options for each category are given below.

A separator is a character which is not part of a name and serves (alone or in a group) in the language to separate one name from another. The user may specify separators as being:

Alphabetic—If specified, all alphabetic characters are separators.

Numeric—If specified, all numeric characters are separators.

Specials—If specified, all non-alphanumeric, non-blank characters are separators.

Blanks—If specified, blanks are separators.

Except—If specified, the characters in the list which follows are *not* to be treated as separators.

Columns—If specified, the numbers in the list which follows are card columns which are to serve as separators.

Certain areas of source text may be ignored, either by specifying card columns to be ignored, criteria for ignoring an entire card, or a character string, after which the remainder of a card may be ignored. The user may specify ignorable areas as being:

Columns—If specified, the list of card columns or card column pairs which follows constitutes a set of fields to be ignored.

Cards—If specified, cards containing any item in the list which follows are completely

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ignored. A list item is a character string followed by the card columns in which the character string's appearance will cause the card to be ignored.

After—If specified, the character string which follows serves as a card terminator, and all information after the terminator string is ignored.

If it is not desired to list all of the names in the source text, a list of names to be exclusively included, or to be excluded, may be made. The user may specify such names by

List—Followed by a list of names to be cross-referenced (all others will be ignored).

Omit—Followed by a list of names to be excluded.

The limited syntax direction allowed by the above user specifications is a two-edged sword; achieving absolute rigor in language definition is impossible, but achieving a simple set of specifications which allows versatility is not only possible but practical. For example, in Fortran there is really no such thing as a separator criteria (e.g. DO10I=1,5, where blanks need not be present since they are ignored), but common usage for reasons of readability has led to the adopting of the blank as a separator (DO 10 I =1,5).

Control language inputs for selected languages are illustrated below:

Natural language:

SEPARATORS = SPECIALS; BLANKS ...

Fortran:

SEPARATORS = SPECIALS; BLANKS. IGNORE COLUMNS 6, 73-80; CARDS C/1 ...

GPSS2:

SEPARATORS = SPECIALS; BLANKS. COLUMNS 7,19,25,31,37,43,49,55,61. IGNORE COLUMNS 67-80; CARDS */1 ...

CONCLUSIONS

XREF, a syntax-directed cross-reference lister implemented on the Univac 1108 at The Boeing Company, is a working example of the usability of syntax-directed techniques for other than compiler-writing applications. It has been used to produce cross-reference lists on texts written in natural language, Fortran, 7080 Autocoder, General Purpose Systems Simulator (GPSS), and machine language. A simple, non-rigorous approach to language specification minimizes the control information required to describe the text language being processed.

Processor speed is somewhat slower than a comparable non-syntax-directed processor because of the large amount of text vs. table comparisons that are made as the source text is read. On the 1108, about 3000-4000 lines of source text are processed per minute, as compared, for example, with the 1108 Fortran compiler speed of roughly 5000 cards/minute. ■

new products

"Alltax" software package which calculates all payroll withholding taxes using one standard formula and a set of tables for federal, state and city taxes is now available in basic cobol for all compilers from Management Information Service. "Alltax" is said to reduce memory requirements and program maintenance when withholding formulas change. Package is completely documented.

For more information circle No. 80
on the Reader Service Card

* * *

Alphanumeric, Incorporated, has opened a service center in Lake Success, N.Y. where graphic arts quality type is being produced from computer output tapes. Utilizing its own high-speed equipment, Alphanumeric can set type at speeds ranging up to 6,000 characters per second from output tapes generated on customer computers.

For computer users with a need for multi-copy reproduction of output data, this service offers the communications effectiveness of graphic type faces combined with the speed and accuracy of the computer.

To use the Alphanumeric TAPE-TO-TYPE service, a customer prepares his output tape in a manner similar to that which he uses to prepare a tape for standard tape-to-print use. A variety of type styles and sizes can be used to create desired page formats.

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on the Reader Service Card

* * *

A solid state two-way device, TELEPATH Code Translator, is now being marketed by Oneida Electronics, Inc. This new device when used with an IBM

024/026/029 Card Punch translates incompatible machine codes such as punched tape and tab cards, and is designed for both on line or off line operation and with or without any teletypewriter station.

Data in tab card form can be either transmitted or created through the TELEPATH translator, connecting a Company's main office with its branch offices.

The TELEPATH translator can be used on line with a computer and thus allows the complete integration of a distant office into any EDP System. The new unit offers programability and flexibility to meet customer requirements. It is also compatible with EIA standards and accommodates Bell System Data sets.

The translator can be used with any model TELETYPEWRITER for putting Card Punch data on line along with providing page copy or tape as by products of the transmission.

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The primary function of four new Pre-set Controllers models by Hewlett-Packard is to count electrical events, and to issue signals and give visual indication when the count or count rate reaches pre-set limits. The instruments were designed for both digital control and measurement—counting, batching, precise control of weight, liquid level, length, frequency, rate, time interval, and many other quantities.

All instruments have 3 modes of operation—the manual, hold and recycle modes.

The four members are model 5331A, 5331B, 5332A and 5332B.

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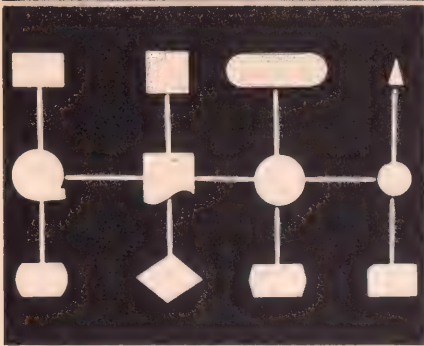
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PERMAtrack is a new VISIrecord Inc. process which provides superior durability to edge-punched cards.

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For more information, circle No. 76
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Equipment and supplies for a method of binding new to the United States, particularly useful on continuous form reports produced on data processing equipment, are now available nationally from Cummins-Chicago Corp.

According to Cummins, the new binding method, called Planax, allows edge-to-edge visibility on bound sheets. This permits programming the printer of a computer to print so much closer to the fold of continuous report forms that form consumption is said to be reduced by over 10%. No bursting or punching of the forms is necessary.

For more information, circle No. 75
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Mastech, Inc., has developed a comprehensive low cost accounts receivable package designed for any IBM System/360.

Configuration utilizing magnetic tape or disc. It is a software system that provides detailed reports on accounts receivable invoicing, sales analysis, cost analysis, inventory source decks, macro and micro flow charts, tape or disc layouts, program narratives, assembly listings, card formats, printer formats, operating instructions, keypunch instructions, and clerical procedures.

For more information, circle No. 74
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With this utility program, by Softpak, Inc., each tape character of a record can be printed as upper case, lower case, hexadecimal value, and overscored characters at the user's discretion. Therefore, a tape produced on any computer can be represented quickly and easily in 360, BCD, EBCDIC, or hexadecimal notations according to the manufacturer. The tape print utility allows fixed length blocked, unblocked or variable length records.

For more information, circle No. 73
on the Reader Service Card

A new IBM-compatible computer tape features an improved binder formula and has been placed on the market by Ampex Corporation.

Coupled with the exclusive Ferro-sheen surface finishing process, 870 Series computer tape provides a smooth surface and

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Ampex guarantees 870 Series tape to be 100 percent free from original permanent errors.

For more information, circle No. 72
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* * *

Tymshare, Inc. has announced a second-generation version of the Beginner's Algebraic Symbolic Interpretive Compiler (BASIC), called SUPER BASIC, now available for subscribers to the firm's time-sharing computer services.

BASIC is a user-oriented language comprised of English and simple algebra. With the more versatile SUPER BASIC, program size has been tripled to accommodate over 900 individual program statements. The programmer can also tack logical and relational operators, along with conditional and iterative modifiers, onto the end of any program statement and chain together virtually unlimited instructions as part of any given computer step. Users may sort, merge, and manipulate from up to three files concurrently. As an alternative to "fast-dump" output, the programmer may now elect picture-frame formats to structure reports under headings and sub-heads, with indented margins.

SUPER BASIC also offers extended arithmetic capability, complete built-in editing features, the use of complex arithmetic, and a larger command repertoire.

For more information, circle No. 71
on the Reader Service Card

* * *

The General Design, Inc., card readers have been designed to provide high-performance, low cost data card readers that will accurately process even the dam-

aged data cards commonly encountered in the data processing and communication industries. It was first shown at the 1968 spring joint computer conference.

The key to this capability is the vacuum pick finger used by GDI to separate a single card from the input deck. This picking technique permits elimination of the sharp, restrictive throat edges which tend to further mutilate cards.

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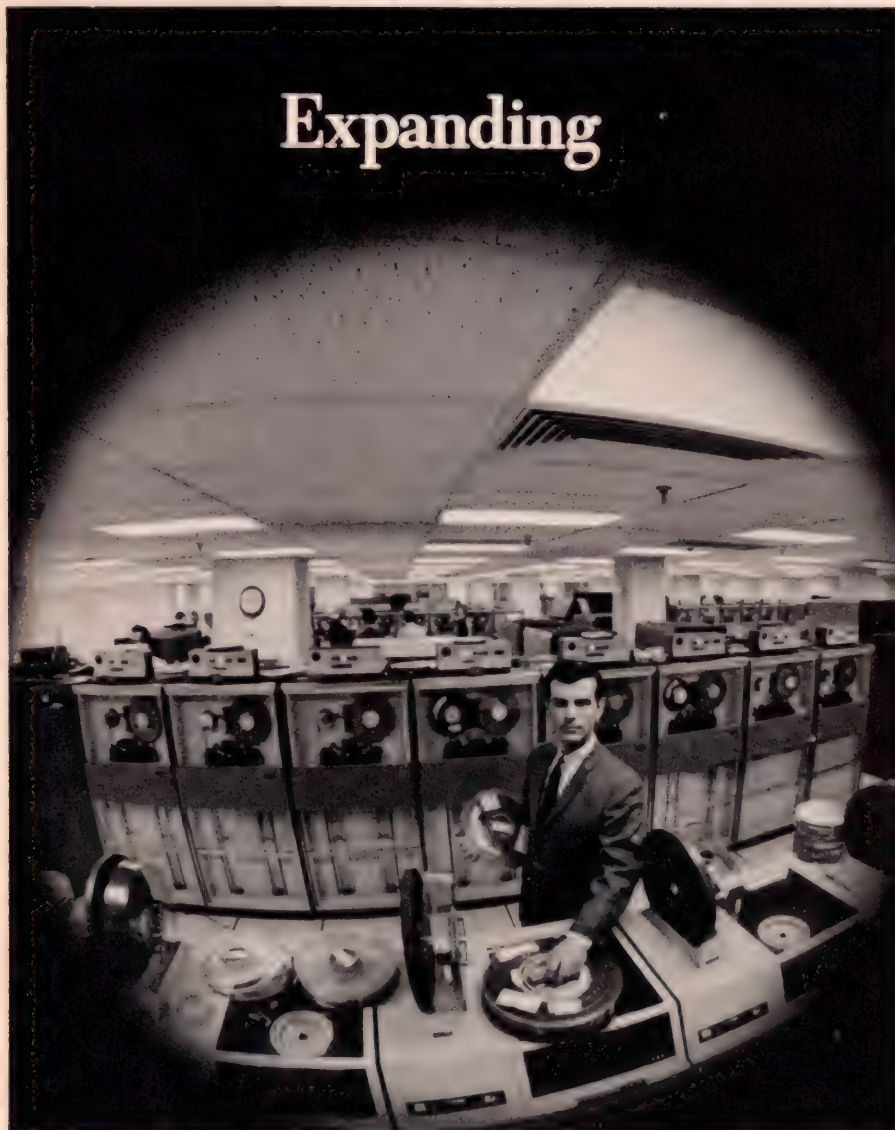
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(Continued from page 20)

are also asked to verify technical content of documentation.

Both the programmer and the technical writer must be alert to detect ambiguities, vague references, and indefinite statements. Cooperative effort may be required to clarify ideas such as those presented in the statement which appears at the beginning of this article.

Style, organization, and methods of presentation are the prerogative of the technical writer. Optimally, a project editor has also been assigned, is knowledgeable of the subject, and conducts an editorial review of the manuscript. Grammatical accuracy, correct use of terminology, and adherence to accepted company policies are vital characteristics of all documentation. Jingoism and excessive use of words or phrases which purportedly are accepted but generally are not defined throughout the industry detracts from rather than enhances the quality of software bulletins and manuals.

Finally, the manuscript is forwarded to production for typing, illustrating, and printing. Efficient, coordinated distribution procedures are mandatory.

When the documented software is marketed, potential users can and do evaluate its capabilities and ease of application on the basis of information presented in supporting announcements, bulletins, and manuals. Indeed, documentation must be viewed as part of the total product just as certainly as procedures necessary to provide the documentation must be viewed as part of the total effort. Users require equipment (hardware), programs (software), and documentation in order to accomplish the tasks which they wish to perform. ■

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	Page
☐ 1. The Boeing Co.	3
☐ 2. California Blue Shield	4th Cover
☐ 3. Computer Sciences Corp.	4
☐ 4. General Electric Information Service Department ..	24
☐ 5. Honeywell, Inc., Electronic Data Processing	11
☐ 6. IBM Corp.	13
☐ 7. Informatics Inc.	12
☐ 8. ITT Federal Electric Corp.	20
☐ 9. Montgomery Ward Data Center	28
☐ 10. National Cash Register Co.	6
☐ 11. Northrop Corp.	16
☐ 12. Pratt & Whitney Aircraft	17
☐ 13. RCA, Information Systems Div.	2nd Cover
☐ 14. Kurt Salmon Associates	27
☐ 15. Sikorsky Aircraft Co.	3rd Cover
☐ 16. Univac Data Processing Div.	23
☐ 17. WABCO, Westinghouse Air Brake Co.	10
☐ 18. Xerox Corp.	7

	Page
EMPLOYMENT AND SEARCH AGENCIES	
☐ 19. Computer Careers, Inc.	26
☐ 20. Computer Personnel Agency	25
☐ 21. Computer Professions, Inc.	19
☐ 22. Davies Associates, Inc.	16
☐ 23. Input, Inc.	25
☐ 24. Knorr Associates, Inc.	26
☐ 25. Lawrence Personnel	27
☐ 26. Management Scientists, Inc.	14
☐ 27. MIS Inc., Management Information Services	25
☐ 28. Professional Career Centers, Inc.	16
☐ 29. RSVP Services	27
☐ 30. Sheridan Associates	4
☐ 31. Source EDP	12
☐ 32. U.C.I. Consultants	18

PRODUCTS AND SERVICES	
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9-----

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- 1—Aerospace/Defense Industry
- 2—Non-Defense Industry
- 3—Commercial/Finance
- 4—Research Organization
- 5—Govt./Military
- 6—EDP Consulting
- 7—Transportation/Utilities
- 8—Education/Library

9-----

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- C—1926-30
- D—1931-35
- E—1936-40
- F—1941-45
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E. Business Programmer	L. Other
F. EDP Management	

TYPE OF INDUSTRY

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N. Other Industry
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